

Evaluation of the transport projects of the Kolari and Sokli mining projects





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Abstract <p>The Kolari–Pajala and Sokli mining projects and related investments are socioeconomically very profitable. According to studies, employment effects and impacts of projects on state and municipal tax revenues are significant.</p> <p>The most essential challenge of the Kolari-Pajala and Sokli mining projects is that both the state and companies are dependent on the decisions of the other party before they can make their own decisions. The state cannot be committed to the projects before it can be guaranteed of the beginning and long duration of company operations. From the viewpoint of companies, they cannot make investment decisions before they know their own logistic costs including participation in the costs of transport infrastructure projects.</p> <p>The Working Group proposes the following further measures for promoting the projects:</p> <ol style="list-style-type: none">1. The state and companies will immediately start negotiations on project agreements, which specify how:<ul style="list-style-type: none">• companies will be committed to long-term mining industry• the state will be committed to the implementation of transport infrastructure investments• companies will participate in the costs of transport infrastructure investments.2. The financing method of transport infrastructure investments will be decided separately by the state at a later date.3. The costs of preliminary planning of transport infrastructure investments (general planning+railway/road engineering) will be divided equally between the state and companies.4. The states of Finland and Sweden will continue cooperation in promoting the Kolari-Pajala project.			
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To the Ministry of Transport and Communications

The Ministry of Transport and Communications appointed a Working Group on 1.10.2008 to prepare a separate study on the transport connections of the Kolari and Sokli mines. This study includes an estimate of socioeconomic benefits and risks of the mining projects as well as the principles, how the state should invest in these projects.

The Kolari–Pajala and Sokli mining projects are located in northern Finland and they are managed by different companies. The cost estimate of the mining projects and related transport investments is almost 3 billion euros.

The Working Group assigned several related studies during its work. Transport infrastructure investments of mining projects (Elron Ltd), regional economic impacts of railway and road investments related to the Pajala–Kolari and Sokli mining projects and port investments of Kemi (the Ruralia Institute), impacts of railway, port and sea route investments as well as the operations of the Pajala–Kolari and Sokli mines on state and municipal tax revenues (the Ruralia Institute). In the Kolari–Pajala project, the Working Group has had cooperation with the Ministry of Enterprise, Energy and Communications in Sweden (näringsdepartementet) and prepared a common study, Joint Finnish-Swedish infrastructure (Report to the governments), which examined the transport infrastructure development needs related to the mining project. In addition, the Working Group has used the study by the Ruralia Institute “Regional economic impacts of the mining sector in Finland on industrial structure and employment” in its work.

The Working Group made two excursions to the mining areas during the work: one trip to eastern Lapland, where the parties involved in the Sokli project were heard, and another trip to western Lapland and Pajala in Sweden, where the parties involved in the Kolari–Pajala project were heard. Furthermore, a cooperation seminar on transport investments of the Kolari–Pajala project was organized during the work in Haparanda together with the Finnish and Swedish authorities.

The members of the Working Group have been presented in the letter of appointment in Appendix 1. In addition to permanent members and secretaries, Senior Engineer Petteri Katajisto from the Ministry of the Environment, Director Keijo Kostainen from the Finnish Maritime Administration, Deputy Director General Alpo Kuparinen from the Ministry of Employment and the Economy, Regional Director Tapani Pöyry from the Lapland road district of the Finnish Road Administration, Director Kari Ruohonen from the Finnish Rail Administration and Senior Adviser Tuomo Suvanto from the Ministry of Transport and Communications have acted as experts in the work.

The deposits of the Kolari–Pajala mining project are located both in Finland (municipality of Kolari) and Sweden (municipality of Pajala), and a company called Northland Resources Inc. is responsible for mining industry. The Sokli mining project is located in the municipality of Savukoski and Yara Finland Ltd is responsible for mining industry. In order to be implemented, both mining projects require investments in the road and railway network. Due to growing transport volumes, sea route to the port of Kemi probably needs dredging.

The extractive sector employed about 4700 persons in the year 2007 and the value of import and export of ore and metals was over 8 billion euros in the year 2008. Impacts of the Kolari–Pajala and Sokli projects on economy and labour policy would be significant and they would mainly be directed to the labour markets of northern Finland, which need additional jobs.

Transport infrastructure investments required by the Kolari–Pajala and Sokli mining projects are significant, a total of about 600-700 million euros. The Kolari–Pajala project would create an investment need of about 280-340 million euros in railways, roads and waterways in Finland. In addition, the mining company has considered it necessary for its operations to construct a railway connection to the mining areas on the Swedish side of the border. The estimated costs of this new railway connection (Äkäsjoki–Kaunisvaara) are about 120 million euros. The starting point of the Working Group has been that transport of mining products from the Kolari–Pajala mine will be directed through the port of Kemi. According to a study, other alternatives are not competitive with regard to transport economy.

The construction of a totally new railway connection and improving road connections are linked to the Sokli project. Cost estimates have not been prepared for all railway alternatives yet, but the estimated cost of upgrading the railway connections will probably be about 260-350 million euros. Improving of road connections will still bring additional costs of about 25 million euros.

Based on the report, the Working Group presents the following:

According to the studies assigned by the Working Group, it can be stated that the Kolari–Pajala and Sokli mining projects are socioeconomically profitable and very profitable especially with regard to regional economy and business economy. The mines will create a significant number of new job opportunities. In the investment phase of the Kolari–Pajala and Sokli mining projects during the greatest need for employment, the cumulative increase of employment during four years would be almost 12 000 man-years as compared to normal development. In the production phase, the mining projects could create over 3600 permanent jobs with multiplier effects, some of which would be located in Pajala in Sweden.

According to studies, the impacts of mining projects on state and municipal tax revenues will also be significant. It is estimated that the Kolari–Pajala mine will bring total additional tax revenues of about 374 million euros for the states of Finland and Sweden during the years 2008-2020. The share of Finland would be about 200 million euros. The Sokli mine would bring additional accumulation of about 180 million euros in tax revenues for Finland during the same time period. If these mines continued their operations at steady capacity after this, the state would collect almost 50 million euros in annual tax revenues. In addition, tax revenues of the municipalities of Lapland would increase by a total of over 40 million euros by the year 2020 and after that by about 2,5 million euros/year.

In order to be implemented, the mining projects require, however, significant transport infrastructure investments. The estimated total investment costs in Finland are about 600-700 million euros. **The most essential challenge of both projects is that both the state and companies are dependent on the decisions of the other party before they can make their own decisions.** The state cannot be committed to the projects before it can be guaranteed of the beginning and long duration of company operations. From the viewpoint of companies, they cannot make investment decisions before they know their own logistic costs including participation in the costs of transport infrastructure projects.

The state is already implementing the upgrading of the Tornio–Kolari rail section due to existing needs of transport operations, but not in a sufficient way with regard to mining industry. The railway connection to the Sokli mine will only be used by the mining company. It is evident from the viewpoint of the state that mining companies should participate in the costs of transport investments. Investments are, however, so significant by magnitude that they would affect the investment decisions of companies.

The Working Group proposes the following further measures for promoting the projects:

1. The state and companies will immediately start negotiations on project agreements, which specify how:
 - companies will be committed to long-term mining industry
 - the state will be committed to the implementation of transport infrastructure investments (final engineering and construction)
 - companies will participate in the costs of transport infrastructure investments.
2. The financing method of transport infrastructure investments will be decided separately by the state at a later date.
3. The costs of preliminary planning of transport infrastructure investments (general planning+railway/road engineering) will be divided equally between the state and companies.
4. The states of Finland and Sweden will continue cooperation in promoting the Kolar–Pajala project.

After completing its assignment, the Working Group respectfully submits its unanimous report to the Minister of Transport.

Helsinki, June 15, 2009

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FOREWORD

A strong mining boom was still underway in Finland in the year 2008 and several projects were planned in the extractive sector. Worldwide recession has, however, slowed down and stopped most of these projects for the time being. Based on estimates, if all projects had been implemented, the annual volume of extraction from metal mines would have increased to 50 million tonnes.

There are seven operating metal mines in Finland. A gold mine was recently opened in Kittilä and a nickel mine was opened in Talvivaara. Annually, about 20 million tonnes of ore is extracted from these mines.

The extractive sector employed about 4700 persons in the year 2007 and the value of import and export of ore and metals was over 8 billion euros in the year 2008. Impacts of the Kolari–Pajala and Sokli projects on economy and labour policy would be significant and they would mainly be directed to the labour markets in northern Finland, which need additional jobs.

The Kolari–Pajala and Sokli mining projects would create a significant number of new job opportunities in Lapland. During the greatest need for employment, when both transport connections and infrastructure are constructed in the mining areas, employment effects during four years would be almost 12 000 man-years. In the production phase, the mining projects could create over 3600 permanent jobs with multiplier effects, some of which would be located in Pajala in Sweden.

It is estimated that the Kolari–Pajala mine will bring total additional tax revenues of about 374 million euros for the states of Finland and Sweden during the years 2008-2020. The share of Finland would be about 200 million euros. The Sokli mine would bring additional accumulation of about 180 million euros in tax revenues for Finland during the same time period. If these mines continued their operations at steady capacity after this, the state would collect almost 50 million euros in annual tax revenues. The production phase of the mines is estimated to bring annual tax revenues of almost 50 million euros. In addition, tax revenues of the municipalities of Lapland would increase by a total of over 40 million euros by the year 2020 and after that by about 2,5 million euros/year.

Some of the mining projects are located in areas where transport infrastructure is insufficient. Transport volumes are significant in some of the projects and they will need both road and railway transport. In addition, investments in ports and sea routes will be needed.

Transport volumes of mining projects depend on the product extracted from the mine. The basic rule is that the more valuable the product is, the less amount of concentrate will be transported. For example, several daily train loads of iron ore are transported from the Kolari–Pajala mine, whereas products from the Suurikuusikko gold mine are transported by single lorries.

The needs of mining projects are diverse with regard to transport infrastructure. Improved road connections serving commuting trips and raw material transport of the manufacturing process are sufficient for some mining projects, whereas in some projects there is an additional need for transporting concentrate also as heavy railway transport.

The Cabinet Committee on Economic Policy expressed an opinion on the mining projects (16.9.2008) and stated that every transport infrastructure investment will be considered separately as an individual case. For larger projects, the Ministry of Transport and Communications was put under obligation to prepare a separate and extensive cost-benefit analysis together with the relevant administration.

Furthermore, the Cabinet Committee put the Ministry of Transport and Communications and the Ministry of Employment and the Economy under obligation to prepare a separate study on the transport connections of the Kolari and Sokli mines, which considers other needs of industrial policy of northern Finland.

The Minister of Transport Anu Vehviläinen appointed a Working Group on 1.10.2008 to prepare a separate study on the transport connections of the Kolari and Sokli mines. The main goal was to estimate socioeconomic benefits and risks of the mining projects as well as the principles, how the state should invest in projects. The Working Group does not commit itself to alternative transport modes and alignments, which were introduced during project planning.

The Working Group assigned several related studies during its work regarding, for example, socioeconomic and transport economic impacts of the mining projects and an analysis of applicable procurement methods of transport projects. The Working Group used these studies to prepare its own conclusions and recommendations. Studies assigned by the Working Group have been listed in Appendix 2.

1 STATE PARTICIPATION IN MINING PROJECTS

1.1 Benefits and risks of the state in mining projects

From the viewpoint of the state, the planned Kolari–Pajala and Sokli mining projects generate considerable regional benefits, but related transport infrastructure investments cause expenses and include risks. The state will receive at least the following benefits from the projects:

- increasing tax revenues
- increasing GNP and income level in the region
- improved level of employment
- improved regional balance (regions with high unemployment).

Increasing tax revenues and improved level of employment as well as other regional benefits have been examined in the calculations made by the Ruralia Institute of the University of Helsinki.

The greatest risks and challenges of the projects are related to transport infrastructure investments:

- amount of investments (about 600-700 million euros), obtaining financing for the projects
- risks related to continued operations of mining industry
- questions related to environment
- impacts on reindeer farming.

1.2 Financing principles of the state in transport investments of mining projects

Shadow toll financing has been applied to the already implemented road projects or projects having preliminary decision related to the mining projects. The mining company will be responsible for the investment and the state will pay it back to the mining company based on previously agreed timetable providing that mining activities are still underway. The state does not pay interest on funding.

An agreement has been made with the mining company in the Talvivaara mining project regarding railway construction, according to which the company will construct and pay for the railway and the state will pay it back during the years 2010 and 2011 providing that mining activities are still underway. With regard to the road connections of the mining project, a budget authority of 8,8 million euros has been approved for financing the planning and construction of road 870 Mustolanmutka–Viinämäki and road 8714 Lehtovaara–Valkealampi in the II state budget of the year 2007. This decision has later been supplemented in the II additional budget of the year 2008 so that the above mentioned share of road 870 will be implemented by financing approved in the budget item of the Kainuu regional development grant, which has a maximum limit of 3,484 million euros. The implementation (planning and construction) of the above mentioned share of road 8714 will be the responsibility of the mining company. The state budget includes a grant authorization of 5,3 million euros for the mining company for the years 2010 and 2011. The Oulu road district made an agreement with the mining company on planning and construction of roads. Im-

provement of roads, which are under the responsibility of the road district and the mining company, was completed in October 2008.

1.3 State guidelines for financing in supporting mining projects

Several state financing methods have been used in supporting mining projects in the 2000s. The Finnish Industry Investments Ltd has made capital investments valued at about 25 million euros in five mining companies during the years 2003-2007. Finnvera plc has provided financing of over 50 million euros for three mining projects during the years 2006-2009.

The Ministry of Trade and Industry/the Ministry of Employment and the Economy has allocated a total of 9,5 million euros of investment and development grants in the 2000s for the infrastructure investments of the operating environment of six mining projects (diagonal tunnels, electric lines and waterlines). The latest decision on support concerns the Pampalo gold mine in Ilomantsi, the Ministry of Employment and the Economy granted 2,5 million euros of development support for infrastructure investments to Endomines Ltd in February 2009.

The Finnish Funding Agency for Technology and Innovation has allocated about 200 000 euros to the research and development work of mineral processing technology in some projects. In addition, the labour and education administration has organized education and courses together with the mining companies for hundreds of people in different institutions during the past couple of years, which are directly or indirectly related to mining industry.

By its decision on 16.9.2008, the Cabinet Committee on Economic Policy provided guidelines for state financing in supporting mining projects. In practice, this decision confirmed the already previously used financing procedures in the administration of the Ministry of Employment and the Economy.

Based on the decision of the Cabinet Committee on Economic Policy, the state can participate in the financing for the final phase of prospecting for ore and for the development phase of the mining project through capital investments (the Finnish Industry Investments Ltd) as well as through loans and guarantees (Finnvera plc). It is possible to use grants and loans from the Finnish Funding Agency for Technology for developing mining technology and mineral processing methods. The mining companies have their own responsibility for the actual mining investments. If necessary, the state could participate in financing, for example, through capital investments as well as through loans and guarantees.

The state can participate in infrastructure investments (for example diagonal tunnels, electric lines and waterlines) related to the operating environment of mines through investment and development grants, when socioeconomic benefits of the project are significant when compared to costs during the entire duration of the project. In this case, the amount of state financing and preconditions for financing will be considered separately in every case. The state can provide a significant contribution to the education of personnel needed in mining industry.

1.4 Participation of the state in infrastructure investments

Based on the objectives to be achieved by the year 2020 presented in the Government transport policy report to the Parliament (27.3.2008), the transport network provides the possibilities for developing and maintaining vitality to the various parts of the country. With regard to transport investments related to mining projects, it is stated that shadow toll financing is the most suitable method for mining projects.

The essential question regarding the infrastructure investments of forthcoming mining projects is the repayment of investment: should the state pay for the investment or will the mining company also participate in the costs. The share of the state could be determined, among other things, by the benefits (for example employment, tax revenues) gained from the project. The criteria in railway investments could include, for example, the possible operations of other freight traffic or passenger traffic on the railway.

Impacts of mining projects on the whole transport network also constitute a significant issue. Upgrading will probably also be needed in other parts of the railway network leading to, for example, additional costs may be generated from increasing bearing capacity. Costs will increase, if cargo is shipped in the railway network for longer distances. Furthermore, port roads and railways require additional investments in many cases.

The state collects a track charge from railway operators, which consists of basic infrastructure charge and infrastructure tax. In addition, an investment tax is part of the infrastructure charge system and concerns operations on the Kerava-Lahti rail section. It would also be possible to allocate similar investment tax to new mine railways. Track charges cover maintenance costs or about 10-15 % of the expenses of rail infrastructure management.

A fairway due is collected from ship owners. The unit price of fairway due for a cargo ship and a passenger ship is determined by the ice class of the ship. When, for a passenger ship or a high-speed craft, fairway dues have been paid 30 times, and 10 times for a cargo ship, the ship's fairway dues will be waived for the rest of the same calendar year. Fairway dues cover the costs of waterway infrastructure management including costs from icebreaking.

In connection with the Vuosaari port project, the state participated in the construction of transport connections in a joint project with the city of Helsinki. A separate project, which was started by the state and joined by the Finnish Road Administration, the Finnish Rail Administration and the Finnish Maritime Administration, was responsible for the implementation of the transport infrastructure of the port.

1.5 Licence process of mining projects

According to section 40 of the Mining Act (503/1965), the utilization of minerals requires the acquisition of mining rights. According to the Mining Act, mining rights are acquired in several phases. First, the entrepreneur must apply for a mining patent from the Ministry of Employment and the Economy. If the Ministry approves this

application, it will commission the land survey office for mining patent proceedings. This phase is called allotment decision on mining patent. When mining patent proceedings have become legal in other respect than compensations, the land survey office will send the record of the proceedings back to the Ministry which will enter the issue in the mining register. At the same time, the applicant will be issued a mining certificate for a valid mining patent. The mining patent will only be valid by the issue of the mining certificate. The material preconditions for the mining patent and the demands of the Nature Conservation Act (1996/1096) will be considered simultaneously, when the allotment decision is made.

This decision also includes the hearing of the concerned and other parties as well as request for comments prior to decision-making. According to the EIA legislation, the EIA statement and related opinion by the contact authority should be available, if needed, when the decision is made. Figure of the advancement process of a mining project is presented in Appendix 3.

Prior to the start of mining operations, the general plan of the mining industry should be approved by the Safety Technology Authority.

The mining company should apply for the environmental permit for the operation of the mine and mineral processing plant as well as for supplementary operations, such as dumping of waste-rock, surface ore, top soil and tailings as well as waste water management. According to the Water Act (264/1961), a licence is often needed for raw water supply and converting areas to a water storage basin as well as for affecting groundwater by the dewatering waters of the mine. Application for the environmental permit regarding water contamination and similar application demanded by the Water Act should be processed together and resolved by the same decision.

According to the Mining Act, land use needs should be considered in the establishment of mining area. This means the consideration of the planning system described in the Land Use and Building Act (132/1999). Impacts of the plan will be examined in preparatory work and extensive participation of different parties will be enabled. It is possible to appeal on the decision of approval of the plan. Building permits should be applied for the construction of buildings included in the mining project. Building permit is issued by the building supervision authority of the municipality.

According to section 23 of the Act on the Safety of the Handling of Dangerous Chemicals and Explosives (309/2005), a licence for extensive industrial handling and storage of dangerous chemicals is required from mining industry. This licence is issued by the Safety Technology Authority.

1.6 Progress of transport infrastructure projects

The planning process of transport infrastructure projects prior to implementation is divided into three phases. Land use planning or zoning is significantly linked to these phases. The planning phases of transport infrastructure projects are:

- feasibility study (preliminary study)
- general planning
- road/railway engineering.

Feasibility study includes preliminary planning, based on which it is decided, if actual project planning will be started. In the general planning phase, first a preliminary general plan and environmental impact assessment (EIA) will be prepared for significant projects and a more detailed general plan will be prepared for the selected alternative. Prior to implementation, a road/railway construction plan will be prepared, the goal of which is to specify the details of planning and the cost estimate of the project.

It should be considered in railway planning that a railway connection cannot be constructed before a related plan with legal effect exists.

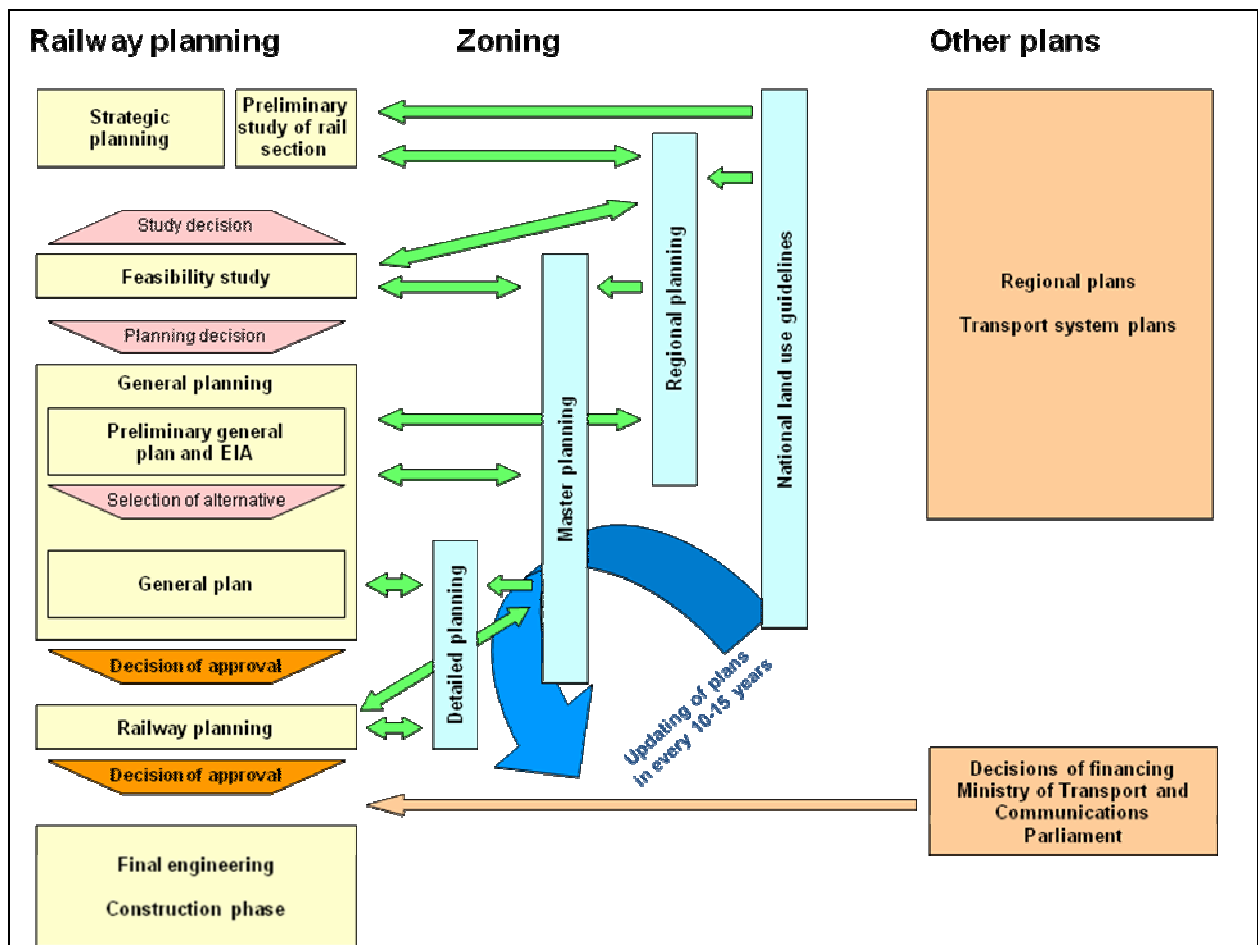


Figure 1. Progress of a transport project.

2 KOLARI–PAJALA AND SOKLI MINING PROJECTS

2.1 Location of projects

The Kolari–Pajala and Sokli mining projects are located in northern Finland and different companies are responsible for the management of these projects. The deposits of the Kolari mining project are located in the Finnish (municipality of Kolari) and Swedish (municipality of Pajala) side of the border. A company called Northland Resources Inc. is responsible for mining industry.

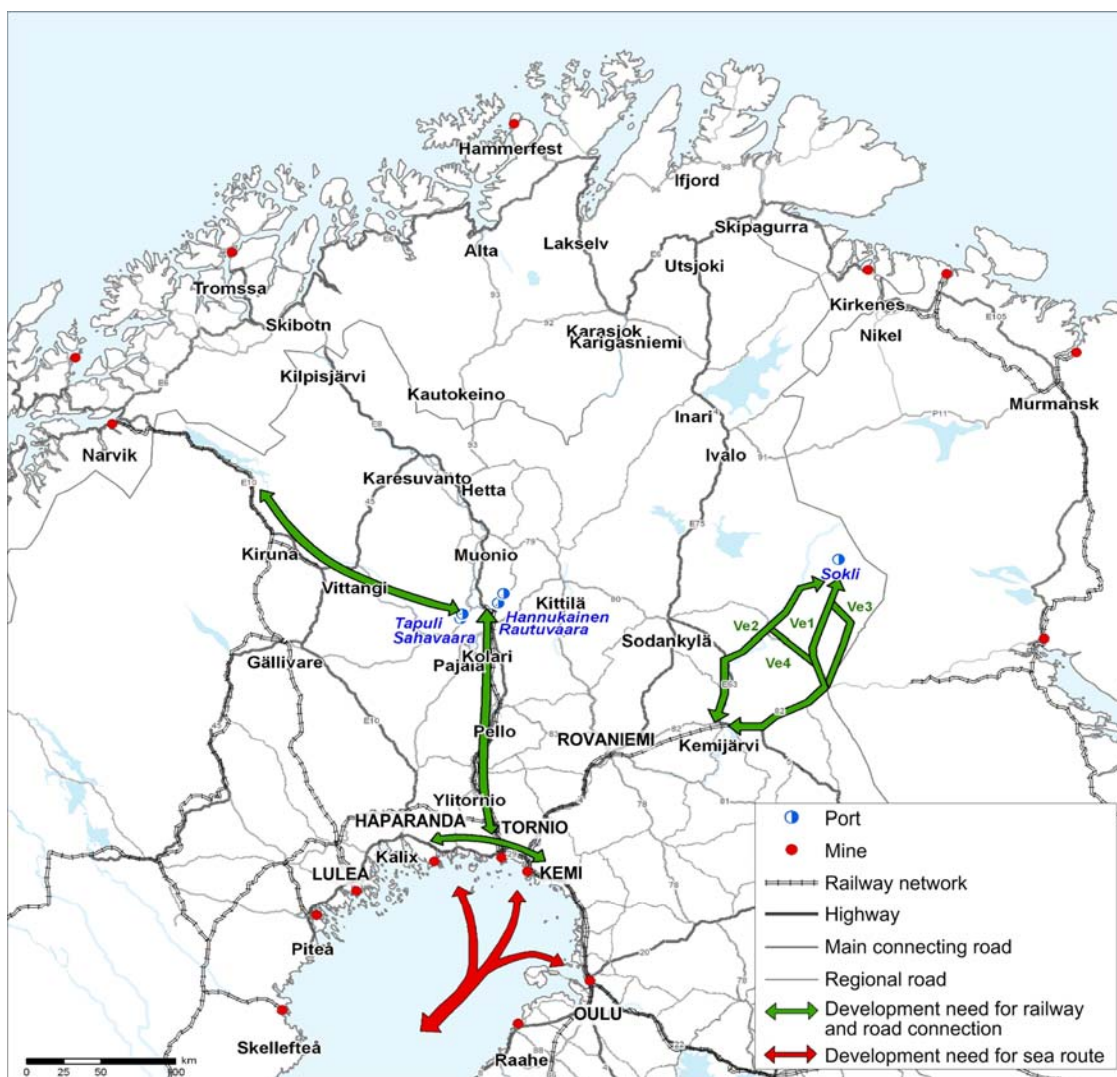


Figure 2. Location of projects.

The Sokli mining project is located in the municipality of Savukoski and the Yara Finland Ltd is responsible for mining industry. Both mining projects will require investments in the road and railway network, and the Kolari mining project will probably require a sea route investment.

2.2 Kolari–Pajala project

2.2.1 Mining company Northland Resources Inc.

The company is a Canadian mining company, which has both advanced and preliminary iron, copper and gold mining projects in Finland and Sweden. However, the company has informed that it will only concentrate on the Kolari–Pajala project in the future. The company does not carry on mining activities and production at the moment.

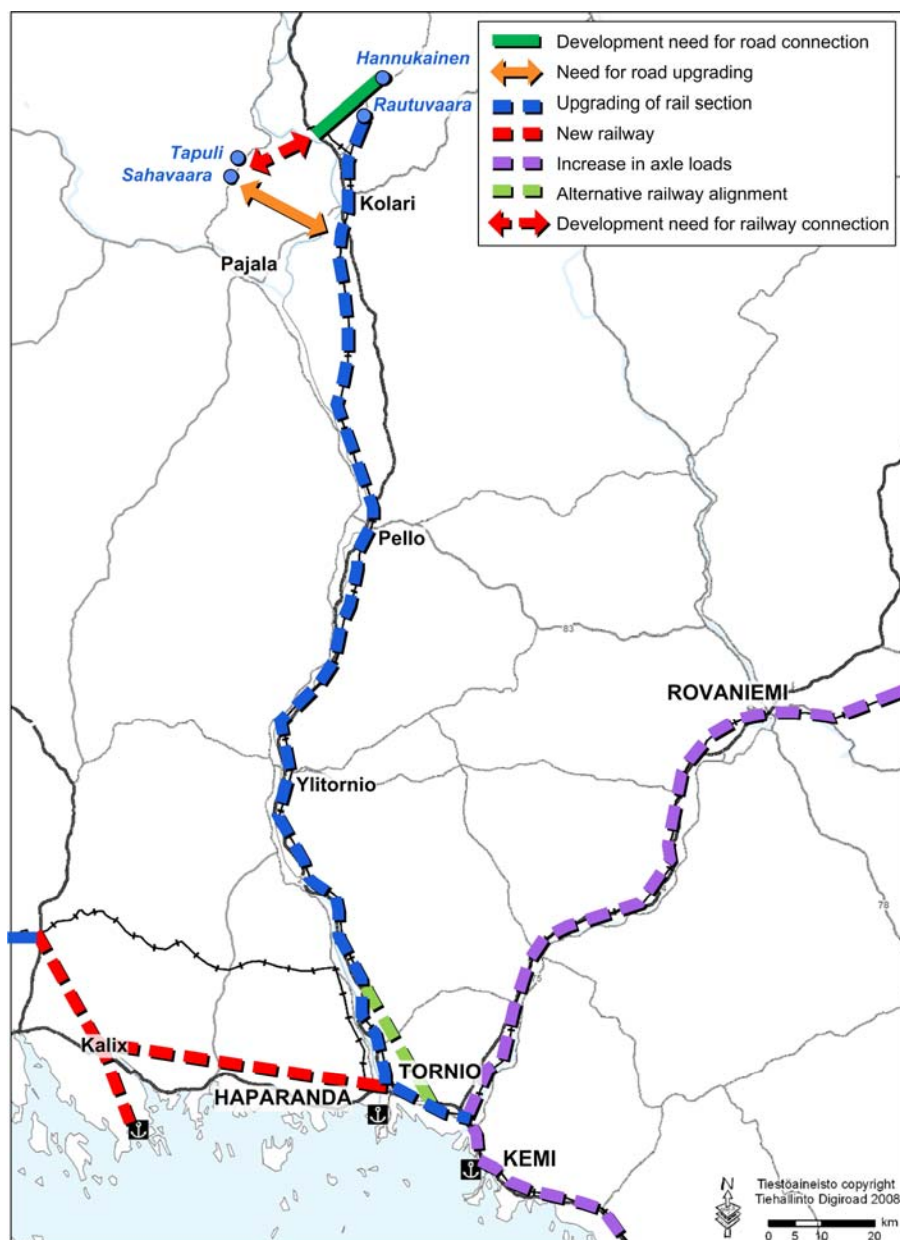


Figure 3. The Kolari–Pajala mining project and related transport investments.

Through the mining project, the goal of the company is to start production and obtain customers in order to secure cash flow and development of operations. The strategy includes the use of local planning and engineering know-how as well as the optimization of excavation and mining plans.

The company wishes to improve the profitability of the project by pellet production, but this requires the construction of a pellet factory, which takes about 18 months. The location of the factory is not decided yet and it will probably not be constructed until in the second phase, when Hannukainen and another mine on the Swedish side of the border will be opened. A new electric line is needed to the factory and the investments costs of the entire mining project are about 1 200 million euros.

2.2.2 *Implementation plan of the project*

According to preliminary plans, mining industry would start by utilizing the Tapuli-vuoma deposit and transport volumes would then be 3 million tonnes/year. Mining production is supposed to grow along with the development of operations and estimated maximum capacity would be about 10 million tonnes/year. Mining industry will generate a significant need for transport, but transport volumes in the preliminary phase could be handled by improving the road network in the area and completing the ongoing upgrading of the Kolari–Tornio rail section.

There are several deposits in the Kolari–Pajala area and the estimated mineral reserves are 500 million tonnes or even more. The verified deposits are sufficient for at least 20-25 years of mining activity. The project requires the development of road connections in the area, development of the Kolari–Tornio rail section, extension of the port of Kemi and dredging the sea route.

Northland Mines Ltd, Northland Exploration Finland Ltd or Northland Resources Inc. do not have a mining patent or related applications. Instead, the Northland Group has about 120 km² of claim areas and equal amount of reserved areas.

It seems like the greater project has been split to smaller phases for accelerating the licence process. Tapuli on the Swedish side of the border will be started first. The construction of, for example, the pellet plant is an unsolved question. Due to the economic situation, plans have been changed recently. Hannukainen on the Finnish side of the border cannot be started for several years.

2.2.3 *Necessary transport infrastructure investments*

Impacts on the railway network

Along with the work of the Working Group, a joint study on the development of transport infrastructure related to the project has been conducted with the transport administrations of Finland and Sweden. According to the conclusions of the report, the railway connection between Kolari and the port of Kemi should be developed first.

Other alternative transport routes, such as route to the port of Kalix in Sweden and Narvik in Norway, have also been studied in the report. These alternatives will not, however, be implemented in the first phase of the study.

The state has already previously made a decision on upgrading the Tornio–Kolari rail section (182,5 km), which started in the year 2008. The Finnish Rail Administration is replacing old rails with new heavy rails, since originally planned recycled rails are not available. Upgrading works will take 3-4 years and the cost of works is 95 million euros.

The Kolari–Äkäsjoki railway is closed for traffic due to its poor condition. It can be upgraded to traffic for a cost of about 1 million euros, and it can be used for 3-4 years with efficient annual maintenance of about 1 million euros. After this the railway must be upgraded to allow for transport of mining products. A rough cost estimate of upgrading the railway with electrification is 20 million euros.

The desired transport volumes of 10 million tonnes/year by the mining company demand several upgrading projects between Kolari and the port of Kemi. The rail structure between Kolari and Tornio should be improved and passing loops should be constructed. Total costs to allow for 25 tonne axle loads are about 210 million euros, The costs of upgrading the railway connection between Tornio and Ajos in Kemi to allow for 25 tonne axle loads are about 23 million euros, and thus the total costs of upgrading the entire rail section from Kolari to the port of Kemi are about 235 million euros.

The mining company has informed that it also needs a railway connection to mining areas on the Swedish side of the border for its operations. The estimated construction costs of the Äkäsjoki–Kaunisvaara connection are about 120 million euros. The project cannot be implemented without continuous cooperation between the states of Finland and Sweden.

It is possible that an EIA-process will be conducted on the railway projects related to the Kolari–Pajala project.

Impacts on the road network

Transport route of the first phase of mining industry will be directed from the Swedish side of the border through the Kolari border bridge to Finland. The mining company would probably improve the private road along the railway (Teuravuoma private road). In this case, the load on the road network would be on road 943 between Kolari and the Swedish border as well as on about two-kilometre section of road 9381 Havela–Kolari. The road can be kept in operable condition by normal maintenance and financing.

The mines of Storasahavaara and Hannukainen require a mineral processing plant and a pellet plant. It is probable that both mines will have their own mineral processing plant, but they can share a pellet plant. The utilization of the Hannukainen deposit will probably require that concentrate/pellet will be transported by lorries to the

railway along the Äkäsjoki road 19722. The length of the upgraded road section is about 14 kilometres and the upgrading works will cost about 5 million euros.

Port of Kemi and waterway projects

Vessels arriving at the Ajos port in Kemi should have ice class 1A super or 1A. Vessels used in iron ore transport have some special features:

- Large bulk vessels cannot be towed by icebreakers
- The 30-metre width of vessels may cause problems in channel navigation
- Even large traffic volumes will not significantly increase the frequency of port visits (13 million tonnes/year corresponds to 1-2 vessels/day depending on vessel size)
- Waiting times of vessels will get longer.

The goal of the mining company is to transport iron ore using as large vessels as possible, which would, however, require dredging of the Ajos sea route in Kemi. The estimated costs of dredging the sea route are as follows:

- 12 metres, 19 million euros
- 12,5 metres, 38 million euros
- 13 metres, 80 million euros
- 14 metres, 132 million euros.

According to a study, which was prepared along with the work of the Working Group, growing transport volumes from the port of Kemi do not require additional icebreaker capacity, but cooperation in icebreaking between Finland and Sweden should be developed.

Land use planning

The transport infrastructure investments of the Kolari–Pajala project on the Finnish side of the border will be located within the areas of the northern Lapland and western Lapland regional plans. The northern Lapland regional plan is a draft and it is supposed to be approved by the Regional Council of Lapland in the end of the year 2009. After that it will be submitted to the Ministry of the Environment for ratification. The preparation of the western Lapland regional plan is not underway at the moment, but the Regional Council of Lapland has plans for starting regional planning.

Cost summary of the mining project and transport projects

The estimated costs of the Kolari–Pajala mining project and related transport projects are presented in table 1.

Table 1. Costs of the mining project and related transport projects.

Mining area	Transport projects, Finland	Transport projects, Sweden
Tapuli, €147 million	Railway, Kolari–Kemi, €235 mill. Railway, Kolari–Äkäsjoki, €20 mill.	Railway, Äkäsjoki–Kaunisvaara, €120 million
Stora Sahavaara, €500 mill.	Road connections, €5 million	
Hannukainen, €550 million	Sea route, Ajos, €19-80 million	
Total, about €1200 million	Total, about €280-340 million	Total, €120 million

2.2.4 *Strengths and weaknesses of the mining project*

The critical factors of the mining project include, among other things:

- Obtaining financing for the project from capital markets
- Implementation of the planned freight flows will require significant investments in the railway network
- World market prices of iron ore.

Strengths of the project:

- The existing rail connections and already decided replacement investments contribute to the start of mining industry
- Mineral reserves for a minimum of 20-25 years.

2.2.5 *Preconditions for decision making by the state of Finland*

- The Kolari–Pajala mine is located in Sweden and Finland. Essential decisions regarding the mines are made by the mining company and by the states of Sweden and Finland.
- The mining company can implement the first phase of mining industry by its own decisions and financing. The first phase includes the implementation of road connection from Pajala across the Tornio river to the loading site along the Kolari railway. The mining company considers that the road capacity will be sufficient for road transport volumes of 3 million tonnes to the loading site of the Kolari railway.
- The mining company considers it necessary that a decision on the railway project will be made before the beginning of the first phase so that increasing mining capacity up to 10 million tonnes will be guaranteed.
- The mining company has signed a letter of intent with the port of Kemi for transporting 3 million tonnes of ore through the port. The port of Kemi will make necessary arrangements in the port area. The depth of the state sea route and ice breaking capacity are sufficient for transport volumes of 3 million tonnes.

2.3 **Sokli project**

2.3.1 *Mining company Yara Finland Ltd*

Yara is a leading manufacturer of nitrogen fertilizers in the world and it has made a strategic decision to expand its operations also to basic production of phosphorus and

potassium. Yara owns the only phosphate deposits (Siilinjärvi+Sokli) in the EU area. Opening of the Sokli mine is a strategic question to Yara for securing raw material for fertilizer production. Yara is a global company and, in addition to Sokli, it has also other phosphate deposits. Starting of mining industry is always based on economic calculations and estimations.

2.3.2 *Implementation plan of the project*

The mine in question is an old deposit, which was found in Rautaruukki's prospecting for ore in the year 1967. A test run for phosphorus ore was performed in the late 1970s in a test factory constructed in Sokli. Mining industry was not, however, started.

The next project was in the 1980s, when mining rights were transferred from Rautaruukki to Kemira. Mining industry was not started in this case either. The latest extension of mining rights was granted in 2007 to Kemira GrowHow (currently Yara Finland Oy) for two years.

Phosphorus, iron and niobium exist in Sokli and the deposit is a 365 million year old carbonatite massif, which covers an area of 20 km² and has a depth of about 150 km. According to the existing plan, phosphorous-rich ore will be sufficient for about 20 years of production. By extensive utilization of the deposit including poorer areas in phosphorous content, operations can be continued for several decades.

Mining rights for the Sokli mining patent have been issued to Rautaruukki Ltd in the year 1976. Mining rights have been transferred from Rautaruukki Ltd to Kemira Ltd and further on to Kemira Agro Ltd, from which rights were transferred to Kemira GrowHow Ltd and currently to Yara Finland Ltd. The mining patent has been decreased in the year 1993 from the original 2420,1 hectares to 1200 hectares. The mining patent has earlier been extended for starting mining industry on 20.11.1991, 30.10.1996, 28.11.2001 and 25.6.2007.

Yara Finland Ltd has submitted an application regarding the extension of the validity period and area of the mining patent. The applied total mining area after extension is about 75 km².

The company estimates itself that preconditions for opening the mine would be met in the year 2015.

2.3.3 *Necessary transport infrastructure investments*

Impacts on the railway network

Yara has started the preparation of the general plan and EIA for the new mine railway. Less than a year has been reserved for the work. The latest plans of the mine railway have been prepared in the year 1987. The total length of the railway would be about 110 kilometres. Based on cost information from the Talvivaara railway, the estimated construction costs using current technology can be about 175 million euros.

In addition, the rail section between Iskokylä in Kemijärvi and Kelloselkä in Salla (about 75 km) must be upgraded. The cost estimate is 85 million euros. Costs have been estimated without electrification. The Finnish Rail Administration will prepare a general plan and more detailed cost estimate of upgrading works. The Kemijärvi–Kemi–Oulu rail section also needs upgrading and, in addition, the Rovaniemi–Kemijärvi rail section will be electrified.

The regional plan of the Sokli mining project is currently being prepared by the Regional Council of Lapland. The plan includes only land use provisions related to the mining project. Several alternative alignments for implementing the railway connection and power lines to the mine have been presented in the draft plan. The length of railway alignments varies as follows:

- Alternative 1 (ve 1), Kelloselkä-Sokli, 104 km, (+ upgrading of the Kemijärvi–Salla railway)
- Alternative 2 (ve 2), Kemijärvi–Pelkosenniemi–Savukoski–Sokli, 166 km
- Alternative 3 (ve 3), Kelloselkä–Naruskajärvi–Sokli, 103 km, (+ upgrading of the Kemijärvi–Salla railway)
- Alternative 4, (ve 4), Kelloselkä–Savukoski–Sokli, 135 km (+ upgrading of the Kemijärvi–Salla railway)

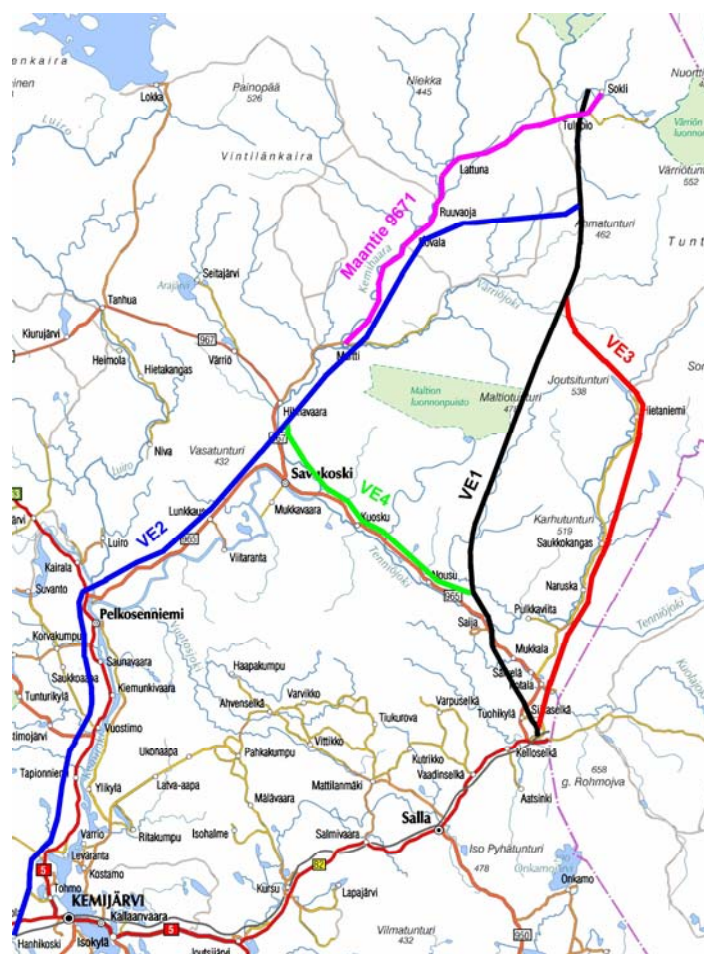


Figure 4. Alternative alignments of railway connections to Sokli.

The aim is to approve the regional plan by the Regional Council of Lapland in the end of the year 2009. After the ratification process by the Ministry of the Environment and possible appeal procedure by the Supreme Administrative Court, the regional plan would be valid during the year 2012 at the earliest.

Due to issues related to the Natura 2000 network, the timetable presented above may still be extended by two years. After this, railway planning can be continued by completing and approving the plans according to the Railway Act, which enable the start of railway construction.

Impacts on the road network

Mining industry requires that road 9671 from Martti village to Sokli would be improved. A road improvement plan has been prepared in the 1980s for the first section of the road (for a 21 km section between Martti–Rovala). The validity of this plan has expired in the year 2002. A road construction plan has been prepared for the section Martti–Rovala at the expense of the mining company and under the supervision of Lapland road district. This plan is going through the legal process according to the Road Act. Estimates of traffic and transport volumes on the road have been received from the mining company with regard to the construction and operation as well as commuting traffic of the mine. According to the timetable presented by the mining company in the EIA-statement, the construction of the mine would start in the year 2012, when road upgrading works should be completed. Chemicals, fuel and other material used in the mine will be transported by road. The width of the existing road with clay-gravel surface varies between 4,5-6,0 metres. Spring thaw, which prevents heavy transport on the road, occurs in the spring.

If the Martti–Sokli road is mainly upgraded at existing location, the costs of upgrading works (final engineering and construction) will then be about 25 million euros.

Summary of the project costs

The costs of the project are presented in table 2.

Table 2. Cost summary of the Sokli project.

Mining area	Transport projects
Sokli, Savukoski €700 million ¹	Railway, Sokli–Kemijärvi, €260-350 million Road connections, Martti–Sokli, €25 million
Total, €700 million	Total, about €285-375 million

2.3.4 *Strengths and weaknesses of the mining project*

The critical factors of the mining project include, among other things:

- The EIA and Natura processes regarding the railway connection may delay the project for years
- Challenges related to ore dressing technology

¹ Estimate used in the calculations of the Ruralia Institute

- Cost competitiveness in relation to other operating, expanding and new mines
- World market prices of phosphate
- Conflicts with, for example, reindeer owner's associations.

Strengths:

- In practice, existing mineral reserves will be sufficient for a minimum of 30 years of mining industry.

2.3.5

Preconditions for decision making by the state of Finland

- The Sokli mining area is located in eastern Lapland near the Russian border and it has no transport connections. A minimum of over 100 kilometres of new railway would be needed along the borderline and 75 kilometres of old railway should be upgraded. The road network would require over 20 kilometres of upgrading works and mining industry cannot be established based on road network.
- Four alternative alignments of railway connections have preliminarily been studied, none of which are unambiguously recommended by authorities and local residents, since the railway alignments would pass through Natura areas and/or reindeer management areas. A distinct opinion on the feasibility and preconditions for implementing a railway connection is expected from the authorities in the environmental sector.
- The mining company can direct transport flows of mining products across the border to Kovdor in Russia.
- Prior to the approval of the railway connection by the environmental authorities, it is not possible to make realistic calculations on total costs, implementation schedule, distribution of costs and method of financing of transport infrastructure.

3 SOCIOECONOMIC IMPACTS OF PROJECTS

3.1 Regional economic impacts of projects on economic growth, tax revenues and employment

The Ruralia Institute of the University of Helsinki assessed the regional economic impacts of the Pajala–Kolari and Sokli mining projects on industrial structure and employment. Impacts on regional economy were calculated in the study based on necessary investments and forthcoming turnover of mines. Calculations were made for the period of 2010–2020 using the CGE RegFinDyn -regional model developed by the Ruralia Institute.

Based on the assessment, railway, port and road investments of both mines would be feasible by regional economic considerations. They would promote production, employment, income, consumption and tax revenues in several subregions in Lapland.

Based on the results, the cumulative long-term impacts of the Pajala–Kolari and Sokli mining projects on economic growth would be 1–3 per cent higher than the estimated normal development for Lapland.

Mines would create a significant number of new job opportunities. In the investment phase of the Pajala–Kolari project during the greatest need for employment in the year 2014, the level of employment would have increased by a total of 6000 man-years during four years, when compared to normal development. The average annual need for employment in the investment phase would be 1200 man-years. In full production phase, the Pajala–Kolari mine would create almost 2500 permanent jobs with multiplier effects by the end of the year 2020. The distribution of jobs between Finland and Sweden is difficult to estimate at this moment.

The employment effects of the investment phase of Sokli would also be significant. Total employment could increase by about 4600 man-years during the four years of investments in 2011–2014, or annual employment would increase by an average of 1150 man-years. In full production phase, the permanent employment effects of the Sokli mine would be about 1100 jobs with multiplier effects by the end of the year 2020.

According to calculations, the Pajala-Kolari mine would bring a total additional accumulation of 374 million euros in taxes and tax-like charges for the states of Finland and Sweden during the years 2008–2020. The share of Finland would be about 206 million euros. The Sokli mine would bring additional accumulation of about 180 million euros in taxes and tax-like charges for the state of Finland. If these mines continued their operations at steady capacity after the year 2020, the state would collect almost 50 million euros in annual tax revenues. In addition, tax revenues of the municipalities in Lapland would increase by a total of over 40 million euros by the year 2020 and after that by about 2,5 million euros/year.

At the maximum, the total impacts of the mines on the economic growth of Lapland would equal to an increase in standard of living of about one normal year. In practice, favourable economic development would occur in subregions and commuter areas, in

other words in smaller units of regional economy than a province, where impacts would be much stronger.

3.2 Regional economic impacts of transport and port investments

According to the results of the study by the Ruralia Institute, large railway investments would be significant especially for the economic growth of subregions. Impacts of infrastructure investments on economic growth are long-lasting.

Through the construction of railway from Äkäsjoki to the port of Kemi, economic growth could increase by a total of 1,3-4,3 % in the subregions of western Lapland by the year 2016. This would mean an average annual growth of 0,1-0,5 %.

With regard to the Sokli mine, the impacts of the Kemijärvi–Kellosoelkä–Sokli railway on the subregions of eastern and northern Lapland would be significant. The economic growth of the eastern Lapland subregion could increase cumulatively by 8,3 % by the year 2013. This would mean an annual average growth of 2,8 %. The total impact of the railway on the economic growth of northern Lapland would be 3 % or an annual average of 0,8 % by the year 2014.

The employment effects of transport infrastructure investments would be positive. The employment effects of railway investments of the Pajala-Kolari mine in western Lapland would be a total of 418 man-years by the year 2015. The employment effects of railway investments of the Sokli mine would be 660 man-years in eastern and northern Lapland by the year 2013.

The port of Kemi would need significant development investments, if the Pajala-Kolari mine was opened. Investments regarding the port area itself would be distributed between the city and entrepreneurs, which operate in the port. The extent of investments would depend on the amount of ore to be loaded. The value of investments would be 50 million euros, if the load was 3 million tonnes/year. Respectively, a load of 6 million tonnes/year would correspond to the need of investments valued at 70 million euros. The maximum loading alternative of 13 million tonnes/year would require total investments valued at 150 million euros. Sea route to the port is owned by the state which would also be responsible for the dredging costs.

The implementation of large port investments would promote steady economic growth in the Kemi-Tornio subregion during the years 2010-2015 and the total growth could be 2 % in the end of the year 2016. This would mean annual average growth of 0,3 %.

Port investments would also promote employment. The number of new jobs would follow the increase in the amount of investments. Employment would grow and new investments would cumulatively create 317 man-years of employment by the end of the year 2016. Annually, a total of 45 new jobs would be created during the seven years of investments. Similarly, the city of Kemi would benefit from the investments directly through increasing income to the port and indirectly through tax revenues.

3.3 Combined employment effects of mining projects and transport projects

Figure 5 shows the cumulative employment effects of the mining projects and transport projects in subregions based on the calculations made by the Ruralia Institute. The maximum impacts would be achieved in the investment phase during four years from start of the projects, when the growth of employment would be almost 12 000 man-years. This estimate includes man-years generated in the investment phase of the Pajala-Kolari and Sokli projects as well as in transport projects.

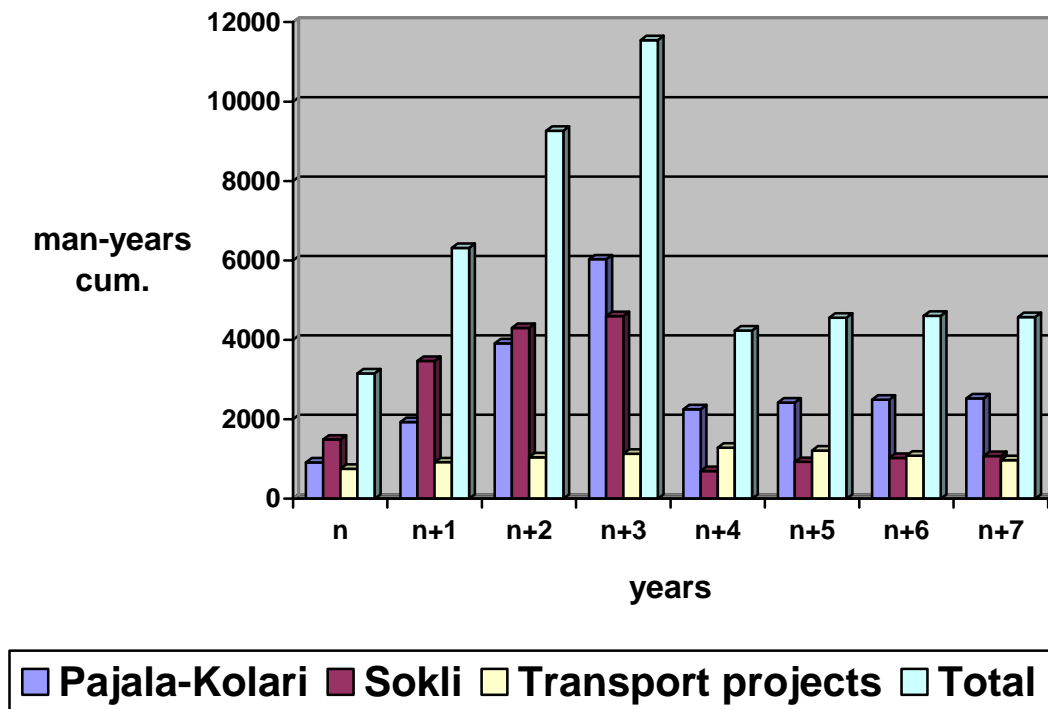


Figure 5. Combined employment effects of mining projects and transport projects.

4 RECOMMENDATIONS OF THE WORKING GROUP

The most essential challenge of the Kolari–Pajala and Sokli mining projects is that both the state and companies are dependent on the decisions of the other party before they can make their own decisions. The state cannot be committed to the projects before it can be guaranteed of the beginning and long duration of company operations. From the viewpoint of companies, they cannot make investment decisions before they know their own logistic costs including participation in the costs of transport infrastructure projects.

Projects and related investments are socioeconomically very profitable. According to studies, the employment effects of projects are significant: the maximum impacts would occur in the investment phase during four years from the start of the projects, when the cumulative growth of employment would be almost 12 000 man-years as compared to normal development. In the production phase of mining projects, they could create over 3600 permanent jobs with multiplier effects, some of which would be located in Sweden.

Impacts of mining projects on state and municipal tax revenues will also be significant. It is estimated that the Kolari–Pajala mine will bring total additional tax revenues of about 374 million euros for the states of Finland and Sweden during the years 2008-2020. The share of Finland would be about 200 million euros. The Sokli mine would bring additional accumulation of about 180 million euros in tax revenues for Finland during the same time period. The production phase of the mines is estimated to bring annual tax revenues of almost 50 million euros. In addition, tax revenues of the municipalities of Lapland would increase by a total of over 40 million euros by the year 2020 and after that by about 2,5 million euros/year.

Mining projects will require transport infrastructure investments which are mainly used only by the mining companies. The Tornio–Kolari railway also has other passenger and freight traffic, but the already decided railway upgrading will be sufficient for the needs of the mining companies. The Sokli railway will not have other transport flows than those of the mining company. From the viewpoint of the state, companies should participate in the costs of transport investments. Investments are, however, so significant by magnitude that they would have a significant impact on the investment decisions of companies. Promotion of projects would need an aggregate decision and an agreement between the state and companies.

The Working Group proposes the following further measures for promoting the projects:

1. The state and companies will immediately start negotiations on project agreements, which specify how:
 - companies will be committed to long-term mining industry
 - the state will be committed to the implementation of transport infrastructure investments (final engineering and construction)
 - companies will participate in the costs of transport infrastructure investments.

2. The financing method of transport infrastructure investments will be decided separately by the state at a later date.
3. The costs of preliminary planning of transport infrastructure investments (general planning+railway/road engineering) will be divided equally between the state and companies.
4. The states of Finland and Sweden will continue cooperation in promoting the Koları–Pajala project.

5 APPENDICES

Appendix 1: Assignment of the Working Group

Appendix 2: Studies assigned by the Working Group and used in the work

Elron Oy, Kaivoshankkeiden väyläinvestoinnit. 2009.

Joint Finnish-Swedish infrastructure, Report to the governments. Banverket, Merenkululaitos, Vägverket, Ratahallintokeskus, Sjöfartsverket, Tiehallinto. 2009.

Törmä H. & Reini K., Pajala-Kolarin ja Soklin kaivoshankkeisiin liittyvien rautatie ja tieinvestointien ja Kemin satamainvestointien aluetaloudelliset vaikutukset. Ruralia-instituutti, raportteja 38, 2009.

Törmä H. & Reini K., Pajala-Kolarin ja Soklin kaivosten rata-, satama- ja meriväyläinvestointien sekä kaivosten toiminnan vaikutukset valtion ja kuntien verotuloihin. Ruralia-instituutti, 2009.

Törmä H. & Reini K., Suomen kaivosalan aluetaloudelliset vaikutukset elinkeinorakenteeseen ja työllisyyteen. Ruralia-instituutti, raportteja 37, 2009.

Appendix 3. Advancement process of a mining project. (Source: The Ministry of Employment and the Economy)

